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(54) **NETWORKED DOOR CLOSER**

(71) Applicant: **Schlage Lock Company LLC**, Carmel, IN (US)

(72) Inventor: **Joseph Wayne Baumgarte**, Carmel, IN (US)

(73) Assignee: **Schlage Lock Company LLC**, Carmel, IN (US)

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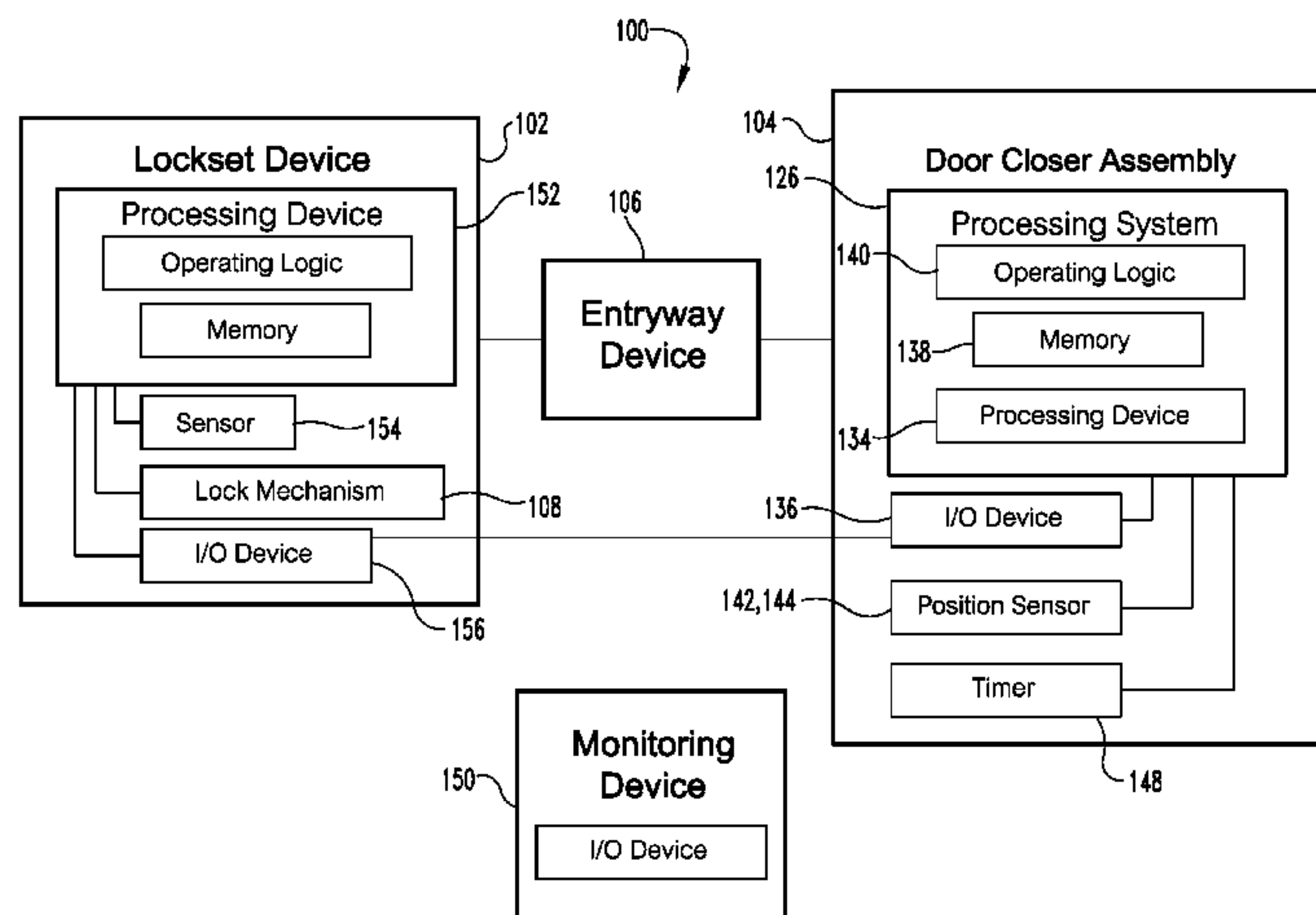
Primary Examiner — Alessandro Amari
Assistant Examiner — Michael Konczal

(74) *Attorney, Agent, or Firm* — Taft Stettinius & Hollister LLP

(57) **ABSTRACT**

A door closer assembly for an entryway device having a position sensor that assists in determining the location of the door closer assembly, and thus the location of the associated entryway device, relative to at least an entryway. The position sensor can be coupled to, and/or part of, the door closer assembly. Information obtained by the position sensor may be used by one or processing devices of an access control system to determine whether the door closer assembly and/or the entryway device is at the closed location, among other locations, as well as the direction(s) of displacement of the entryway device. Such information may be utilized in calibrating other devices, as well as determining the occurrence of a number of events, including unauthorized displacement or holding of the entryway device. A timer

(Continued)



may also be utilized to further evaluate the nature of the displacement of the entryway device.

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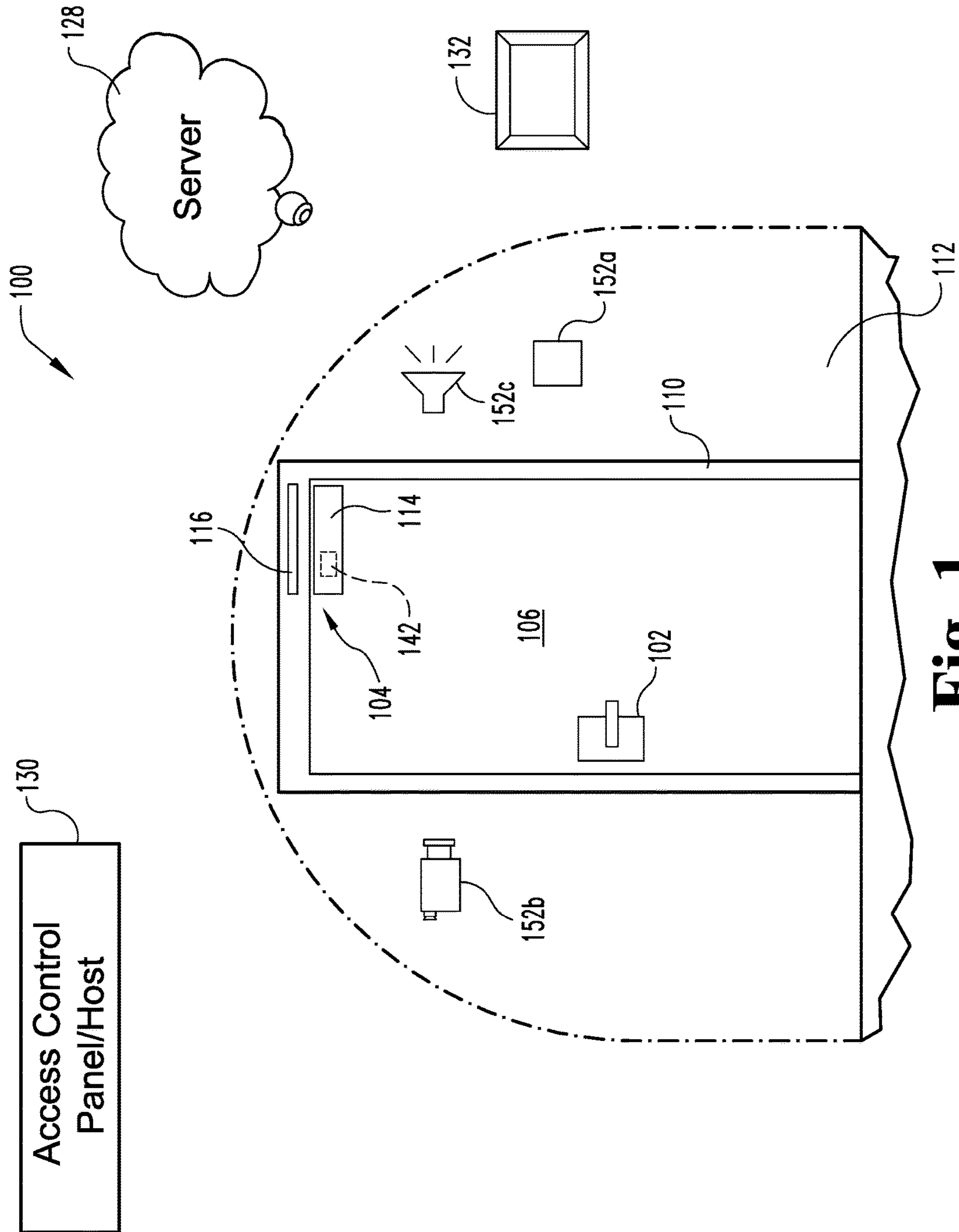
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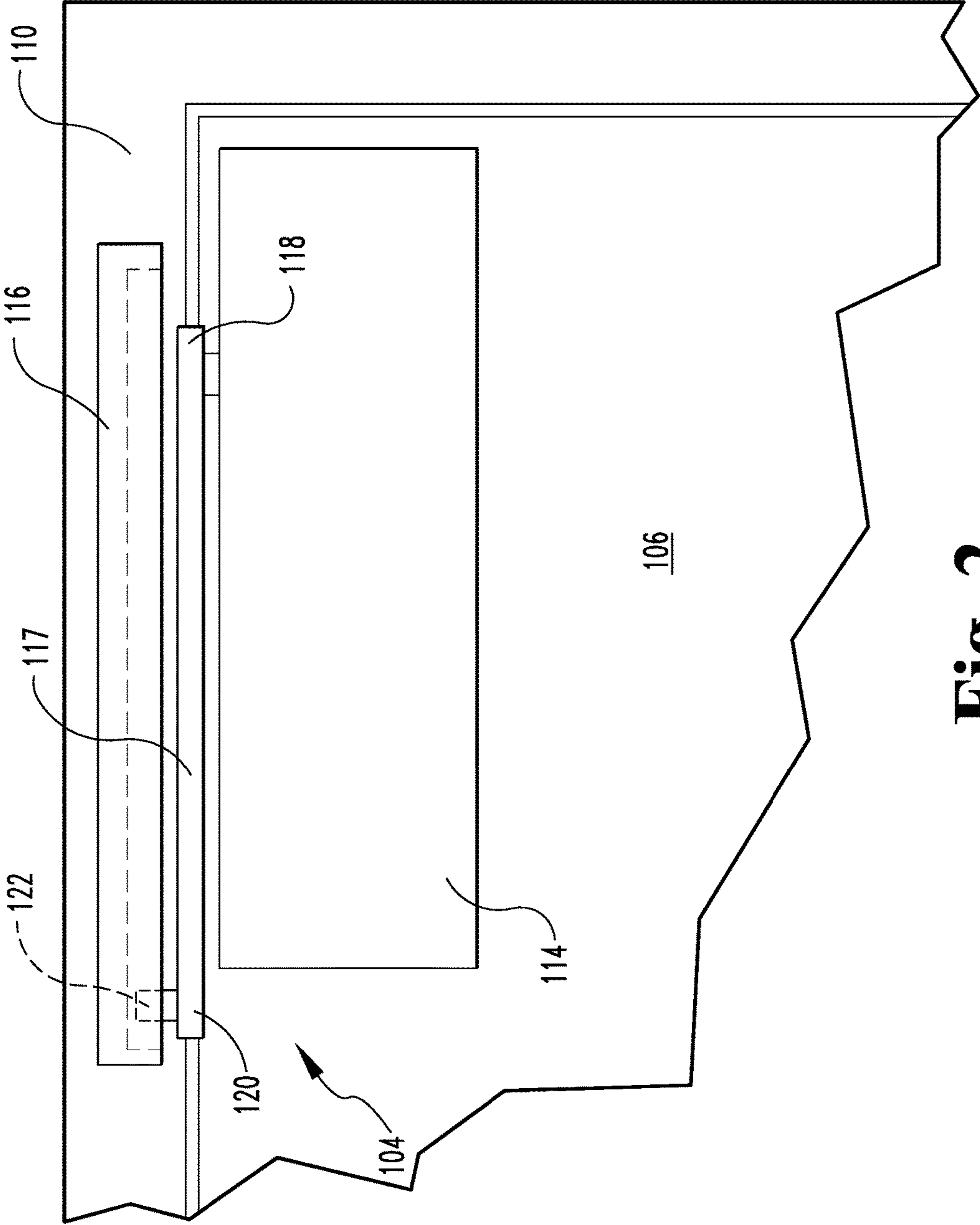


Fig. 2

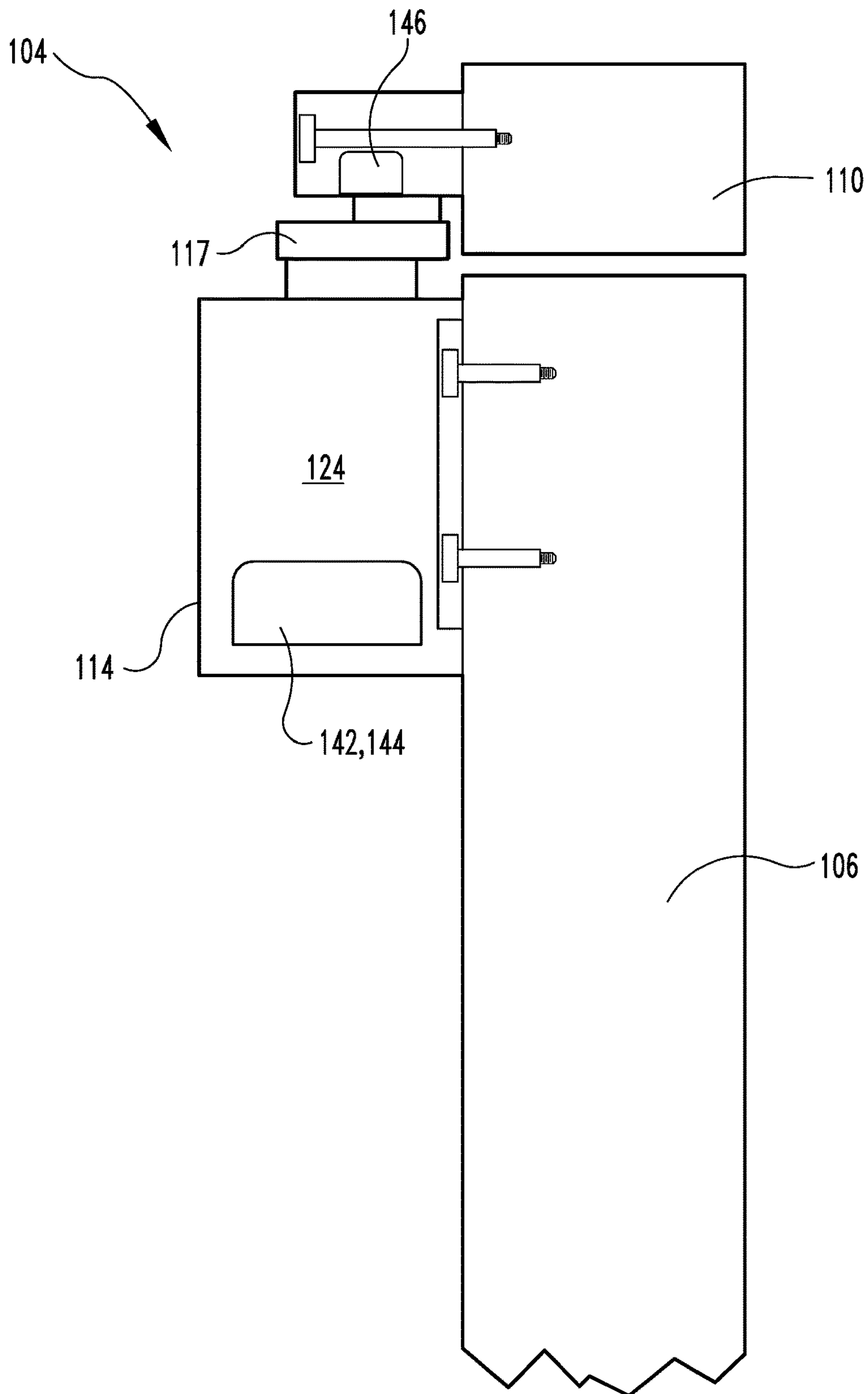


Fig. 3

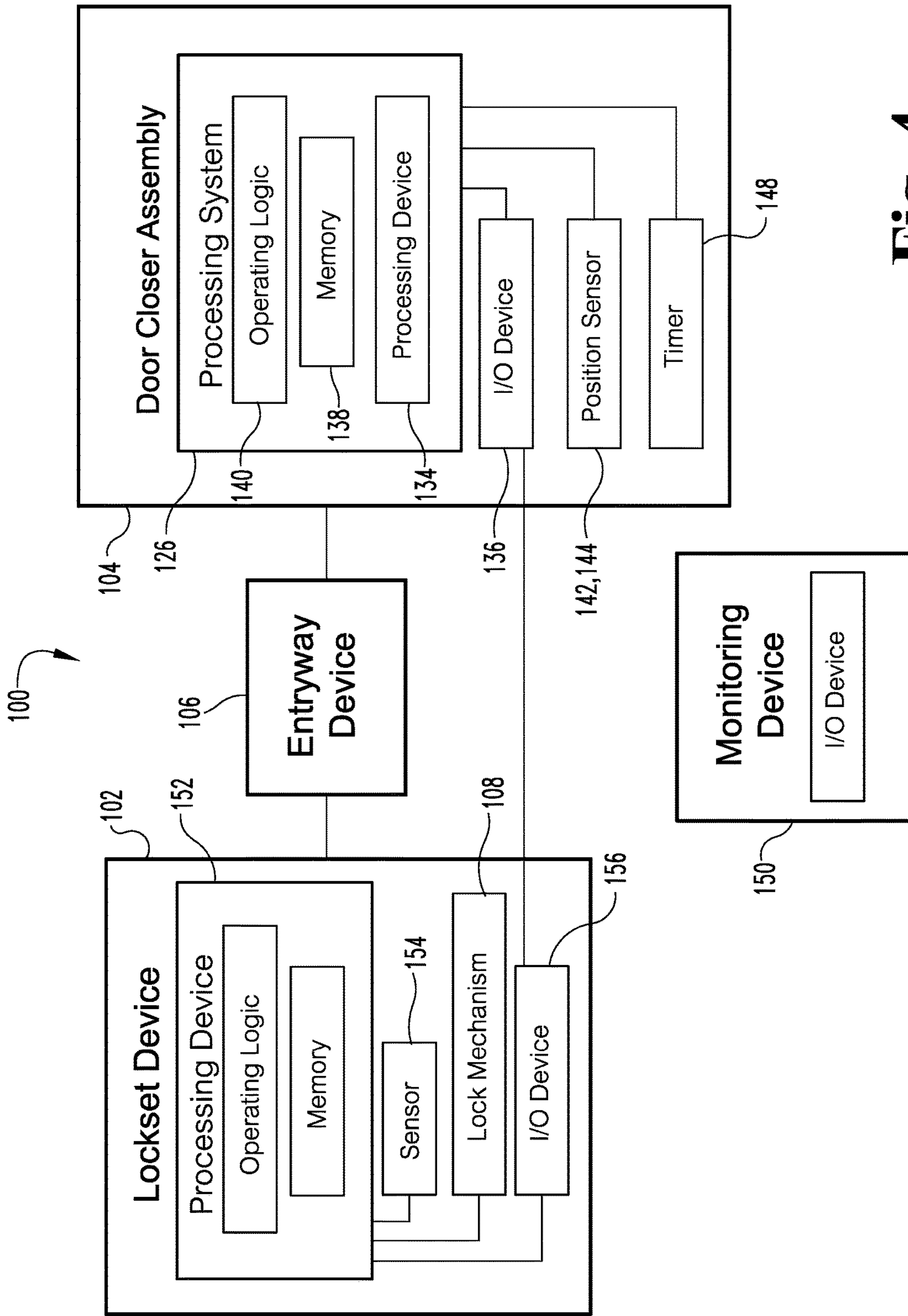


Fig. 4

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NETWORKED DOOR CLOSER**CROSS REFERENCE TO RELATED APPLICATIONS**

The present application claims the benefit of U.S. Provisional Patent Application Ser. No. 62/169,078, filed Jun. 1, 2015, which is incorporated herein by reference in its entirety.

BACKGROUND

Embodiments of the present invention generally relate to determining the position of entryway devices. More particularly, but not exclusively, embodiments of the present invention relate to the determination and communication of the position of an entryway device by a door closer assembly.

Door closers, including, but not limited to, automatic door openers, are often utilized to provide a force or other action that at least assists in the displacement of an entryway device between an open location and a closed location. Moreover, a door closer can provide a force that at least assists the displacement of an entryway device, including a door, gate, or barrier, among other devices, to a closed location, for example, at which the entryway device may be positioned to inhibit or prevent ingress/egress through an associated entryway. Thus, door closers may be structured to automatically return an opened, or partially opened, entryway device to a closed location, and thereby remove the need for manual closing by a user.

Whether an entryway device is at an open or closed location has traditionally been automatically determined through the use of supplemental sensors that are applied to the entryway device or the lockset device. Yet, such supplemental sensors can add to the complexity and/or overall cost of the entryway system. Further, the inclusion of such supplemental sensors may increase the time and costs associated with installation of the entryway device, including, for example, costs associated with the installation, calibration, and/or preparation of the supplemental sensor(s). Further, in at least certain instances, the supplemental sensors may be limited to indicating whether the entryway device is in the open location or is in the closed location, and thereby not provide an indication of where the entryway device may be between the open and closed locations.

BRIEF SUMMARY

An aspect of an embodiment of the present application is a method that includes detecting, by a position sensor, data indicating a position of a door closer assembly. Further, at least a portion of the position sensor is positioned within the door closer assembly. The detected data is transmitted to a processing device and evaluated by the processing device in view of one or more sets of reference data. Additionally, the one or more sets of reference data can correspond to one or more locations of the door closer assembly. The method further includes determining, based on the evaluation of the detected data and the one or more sets of reference data, a current location of the door closer assembly.

Another aspect of an embodiment of the present application is a method that includes monitoring a position and a displacement of an entryway device via a position sensor of a door closer assembly, the door closer assembly being located on the entryway device. The data obtained by the position sensor is transmitted to a component within a lockset device, at least a portion of the lockset device being

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located on the same entryway device as the door closer assembly. Additionally, a magnetometer located within the lockset device is calibrated using the data received by the component that was obtained by the position sensor of the door closer assembly.

Additionally, an aspect of an embodiment of the present application is a method that includes detecting, by a position sensor of a door closer assembly, a position of a door closer assembly. Further, at least a portion of the door closer assembly is coupled to an entryway device. A processing device can use the detected position to determine that at least one of the door closer assembly and the entryway device is at a closed location. Further, the determination of the processing device that at least one of the door closer assembly and the entryway device is at the closed location can be communicated to a lockset device that is coupled to the entryway device. Additionally, upon receipt of the communication of that at least one of the door closer assembly and the entryway device is at the closed location, a sensor located within the lockset device can be calibrated.

BRIEF DESCRIPTION OF THE DRAWINGS

The description herein makes reference to the accompanying figures wherein like reference numerals refer to like parts throughout the several views.

FIG. 1 illustrates a schematic view of an exemplary access control system that utilizes a door closer assembly in connection with determining and communicating the position of the door closer assembly and/or an associated entryway device.

FIG. 2 illustrates a front view of an exemplary door closer assembly positioned on an entryway device and an adjacent entryway frame or wall.

FIG. 3 illustrates a side cutaway view of the exemplary door closer assembly, entryway device, the entryway frame, and the wall that are shown in FIG. 1.

FIG. 4 illustrates a schematic of a block diagram of an exemplary processing system for a door closer assembly.

The foregoing summary, as well as the following detailed description of certain embodiments of the present invention, will be better understood when read in conjunction with the appended drawings. For the purpose of illustrating the invention, there is shown in the drawings, certain embodiments. It should be understood, however, that the present invention is not limited to the arrangements and instrumentalities shown in the attached drawings.

DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

Certain terminology is used in the foregoing description for convenience and is not intended to be limiting. Words such as “upper,” “lower,” “top,” “bottom,” “first,” and “second” designate directions in the drawings to which reference is made. This terminology includes the words specifically noted above, derivatives thereof, and words of similar import. Additionally, the words “a” and “one” are defined as including one or more of the referenced item unless specifically noted. The phrase “at least one of” followed by a list of two or more items, such as “A, B or C,” means any individual one of A, B or C, as well as any combination thereof.

FIGS. 1-3 illustrate an exemplary access control system 100 that includes an exemplary lockset device 102 and an exemplary door closer assembly 104 that are operably coupled to an entryway device 106, such as, for example, a

door or gate, among other similar devices. The ability to displace the entryway device **106** from a closed location, wherein the entryway device **106** is positioned to prevent passage through an associated entryway, to an open location may be controlled, at least in part, by the operation of the lockset device **102**, at least a portion of which can be operably mounted, or otherwise coupled, to at least the entryway device **106**. According to certain embodiments, the lockset device **102** is an electronic lockset device that includes a lock mechanism **108**, that includes, for, example, a bolt and/or latch, that can selectively lockingly engage the adjacent entryway frame **110**, wall **112**, and/or mating components that are coupled or mounted to/in the adjacent entryway frame **110** and/or wall **112** when the entryway device **106** is at least in the closed location.

According to the depicted embodiment, the door closer assembly **104** can include a closer body **114** that is coupled to a slide channel **116** by one or more closer arms **117**. According to the illustrated example, a first end **118** of a closer arm **117** may be pivotally coupled to the closer body **114**, while a second end **120** of the closer arm **117** is pivotally coupled to, and displaceable along, the slide channel **116**. Embodiments of the present application are, however, not limited to the exemplary door closer assembly **104** discussed herein, and may be utilized with a variety of other types of door closer assemblies.

The closer body **114** and the slide channel **116** may be mounted at a variety of different locations along an entryway device **106**, entryway frame **110**, and/or wall **112**. For example, according to the illustrated embodiment, at least one of the closer body **114** and the slide channel **116** may be mounted by a mechanical fastener, such as, for example, a screw, bolt, or pin, or via an adhesive, among other manners of mounting, to an outer surface of an entryway device **106**, while the other of the closer body **114** and the slide channel **116** is mounted to the entryway frame **110**, or a portion of a wall **112** that is adjacent to the entryway device **106** or entryway frame **110**. Alternatively, according to certain embodiments, rather than being mounted on, or extending from, an outer surface of the entryway device **106**, entryway frame **110**, and/or wall **112**, at least a portion of the closer body **114** and/or the slide channel **116** may be at least partially concealed or recessed within entryway device **106**, entryway frame **110**, and/or wall **112**.

The first end **118** of the closer arm **117** may be pivotally coupled to the closer body **114** in a variety of manners, including, but not limited to, by a first coupler, including a pin, post, or bolt, among other connections. According to certain embodiments, the first end **118** of the closer arm **117** may be pivotally coupled to a backcheck mechanism or valve that may be used to at least control the speed at which the entryway device **106** may be displaced from an open location to a closed location. According to certain embodiments, the backcheck mechanism may be of the hydraulic type.

The slide channel **116** may, according to certain embodiments, be a channel or track that receives slideable insertion of an arm coupling **122**, such as, for example, a pin, post, projection, or bolt, that is coupled to the second end **120** of the closer arm **117**. Moreover, the arm coupling **122** may be coupled to the second end **120** of the closer arm **117** in a manner that allows both rotational and linear displacement of the closer arm **117** relative to slide channel **116** as the closer arm **117** is displaced with the opening and closing of the entryway device **106**. Further, according to other embodiments, the closer arm **117** may include two or more arm segments. For example, according to certain embodi-

ments, the closer arm **117** may include a first arm segment that is pivotally coupled to a second arm segment, the first arm segment including the first end **118** of the closer arm **117** and the second arm segment including the second end **120** of the closer arm **117**.

The closer body **114** may include an outer wall that generally defines an inner region **124** of the closer body **114**. Further, according to certain embodiments, the outer wall may comprise of a plurality of sidewalls. Further, according to certain embodiments, the closer body **114** may include a cover (not shown), such as, for example, an ornamental cover, that may be positioned over at least a portion of the outer wall of the closer body **114**.

Referencing FIG. **4**, the door closer assembly **104** may include a processing system **126** that may be used in connection with at least one or more operations for the door closer assembly **104**, including, for example, determining and/or communicating information relating to the position of the door closer assembly **104** and/or the associated entryway device **106**. Moreover, according to certain embodiments, the processing system **126** may interpret information and/or control the transmission of information to other components of the access control system **100**. For example, referencing FIG. **1**, according to certain embodiments, the door closer assembly **104** may be in communication with one or more devices of the access control system **100**, including, for example, one or more servers **128**, the lockset device **102**, an access control panel or host **130**, and/or a mobile electronic device **132**, among other devices. Such communications with the door closer assembly **104** and other devices of the access control system **100** may occur in a variety of different manners, including, for example, over a wide area network (WAN) (e.g. the Internet), a cellular data network, a local area network (LAN), WIFI, and/or through the use of another type of wireless communication protocol, or any combination thereof. For example, according to certain embodiments, the door closer assembly **104** may be communicatively coupled to the lockset device **102**, such as, for example, through a wired and/or wireless connection, such that communications from/to the door closer assembly **104** are transmitted, received and/or retrieved by an input/output device **156** of the lockset device **102**. Further, according to certain embodiments, devices of the access control system **100** may directly and/or indirectly communicate with the door closer assembly **104**. For example, according to certain embodiments, and as discussed below, the door closer assembly **104** includes an input/output device **136** that is adapted to communicate directly with other components of the access control system **100**. Alternatively, the lockset device **102** may indirectly communicate with at least certain components of the access control system **100**.

According to the illustrated embodiment, the processing system **126** of the door closer assembly **104** includes a processing device **134**, the input/output device **136**, a memory **138**, operating logic **140**, and/or a position sensor **142**. The processing system **126** may be positioned about, or extend along, one or more portions of the door closer assembly **104**. For example, according to the illustrated embodiment, the processing system **126** may be housed in the inner region **124** of the closer body **114**. Further, the processing device **134** can be a programmable type, a dedicated, hardwired state machine, or any combination of thereof. Additionally, the processing device **134** may further include multiple processors, Arithmetic-Logic Units (ALUs), Central Processing Units (CPUs), Digital Signal Processors (DSPs), or the like. Further, according to certain embodiments in which the processing device **134** has mul-

tiple processing units, the processing units may utilize distributed, pipelined, and/or parallel processing. Further, the processing device **134** may be dedicated to performance of the operations described herein, or may be utilized in one or more additional applications or operations. In the depicted form, processing device **134** is of a programmable variety that executes algorithms and processes data in accordance with operating logic **140** as defined by programming instructions (such as software or firmware) stored in a memory **138**. Alternatively, or additionally, the operating logic **140** for processing device **134** is at least partially defined by hardwired logic or other hardware. The processing device **134** may also include one or more components of any type suitable to process the signals received from an input/output device **136** or elsewhere, and to provide desired output signals. Such components may include, but are not limited to, digital circuitry, analog circuitry, or a combination of both.

The processing device **134** may be included with, or be coupled to, a memory **138**. Further, the memory **138** may be of one or more types, such as, for example, a solid-state variety, electromagnetic variety, optical variety, or a combination of thereof. Additionally, the memory **138** can be volatile, nonvolatile, or a combination thereof, and some or all of the memory **138** can be of a portable variety, such as, but not limited to, a disk, tape, memory stick, cartridge, or the like. Additionally, the memory **138** can store data that is manipulated by the operating logic **140** of the processing device **134**, such as, for example, data representative of signals received from and/or sent to input/output device **136** in addition to, or in lieu of, storing programming instructions defining the operating logic **140**, just to name one example.

Additionally, the circuitry of the processing system **126** of the door closer assembly **104** may be configured to provide appropriate signal conditioning to transmit and receive desired information (data), and correspondingly may include filters, amplifiers, limiters, modulators, demodulators, CODECs, digital signal processing, and/or different circuitry or functional components to perform various selected communications. Further, as previously discussed, the door closer assembly **104** may communicate with the lockset device **102** and/or one or more other devices of the access control system **100** via the input/output device **136**, such as, for example, via wireless communications, such as, but not limited to, communications that utilize WIFI and/or a wireless communication protocol, such as, for example, Bluetooth (including Bluetooth low energy), Zigbee, Near Field Communication (NFC), and/or IEEE 802.15, among others. For example, according to the illustrated embodiment, the input/output device **136** may be a transceiver that is coupled to the processing device **134** and which can output signals for transmission to, as well as receive signals from, other devices of the access control system **100**. However, a variety of other components may be utilized for, or with, the input/output device **136** of the processing system **126** of the door closer assembly **104**, including, but not limited to: a network adapter, network card, interface, or a port (e.g., a USB port, serial port, parallel port, an analog port, a digital port, VGA, DVI, HDMI, FireWire, CAT 5, or any other type of port or interface), as well as combinations thereof. Alternatively, as previously mentioned, according to certain embodiments, rather than utilizing wireless communications, the processing system **126** of the door closer assembly **104** may be hardwired to a processing device **134** of the lockset device **102**, among other devices of the access control system **100**.

The position sensor **142** is adapted to sense a position or location of the door closer assembly **104**, and thus the position or location of the entryway device **106**. According to such an embodiment, the position sensor **142** is a magnetometer **144**, such as, for example, a vector magnetometer, total field magnetometer, and/or a scalar magnetometer. Additionally, the magnetometer **144** may provide a variety of types of measurements or other information that may be utilized by a processing device of the magnetometer **144** and/or the processing device **134** of the processing system **126** of the door closer assembly **104**. For example, according to certain embodiments in which the position sensor **142** is a magnetometer **144**, the magnetometer **144** may provide measurements as a one, two, and/or three dimensional quantity, and/or as a scalar value(s), such as, but not limited to, scalar measurements along each of the three directional axes. However, a variety of other types of position sensors may be used to provide or determine the position of the door closer assembly **104**, and thus the position of the entryway device **106**. For example, the position sensor **142** may be an inductive sensor, reed switch, Hall Effect sensor, and/or a mechanical switch, among other types of sensors. Further, according to certain embodiments, the position sensor **142** may be incorporated into the circuitry of the processing device **134**.

The position sensor **142** can be adapted to detect, or provide information that is used to detect, the position or orientation of the position sensor **142**, a portion of the sensor **142**, or a reference point relative to the position sensor **142**, and thereby detect the position of the associated door closer assembly **104**. For example, according to embodiments in which the position sensor **142** is a magnetometer **144**, the magnetometer **144** may detect changes in position of the magnetometer relative to a reference magnetic field. Thus, according to certain embodiments, the magnetometer **144** may be coupled to, or positioned along a portion of the door closer assembly **104** that is displaced with the displacement of the associated entryway device **106**. Thus, according to such an embodiment, the reference magnetic field may be, relative to the magnetometer **144**, generally relatively stationary or static. For example, according to certain embodiments, the reference magnetic field may be the magnetic field of the earth. According to other embodiments, the reference magnetic field may be provided by a reference magnet **146** that may be at a variety of locations adjacent to, within, and/or part of the, the door closer assembly **104**. According to other embodiments, the reference magnet **146** may be a magnetized material that is used to form a portion of a device of the access control system **100**, such as, for example a portion of the door closer assembly **104** or a door strike plate for the lockset device **102** that is mounted to the entryway frame **110** and/or wall **112**, among other devices or components.

Conversely, according to other embodiments, the magnetometer **144** can be positioned at or about a portion of the door closer assembly **104** that remains relatively stationary or static, while the reference magnet **146** or magnetized material that provides the reference magnetic field is displaced by the displacement of entryway device **106** between the open and closed locations. For example, according to certain embodiments, the magnetometer **144** may be coupled to a stationary portion of the slide channel **116**, while the closer body **114** may house or be coupled to the reference magnet **146**. Alternatively, the closer body **114**, among other components of the door closer assembly **104** that are displaced by the displacement of the entryway device **106** that includes a magnetized material that provides

the reference magnetic field. According to other embodiments, the reference magnetic field may be provided by another component of the access control system **100** that are displaced by the displacement of the entryway device **106**, such as, for example, a portion of the lockset device **102**.

According to such embodiments, the position sensor **142** may be used to detect, or otherwise provide information that is used to detect, changes in location of the door closer assembly **104**, and thus provide an indication of the displacement of the associated entryway device **106**. Further, according to certain embodiments, the processing device **134** of the processing system **126** of the door closer assembly **104**, or a processing device of another device(s) of the access control system **100**, may analyze the information provided by the position sensor **142** to determine a position of the door closer assembly **104**, which may, again, provide an indication of the position of the associated entryway device **106**. Further, as discussed below, according to certain embodiments, the processing device **134** of the processing system **126** of the door closer assembly **104** may compare information that is being provided by position sensor **142** in view of reference information or data to determine whether the door closer assembly **104**, and thus the associated entryway device **106**, is, or is not, in the closed location, the current location of the either of those devices **104**, **106**, and/or the direction of such displacement.

The position sensor **142** of the door closer assembly **104** may be calibrated so that information provided by the position sensor **142** can be at least correlated to one or more positions of the door closer assembly **104**, which may indicate corresponding positions of the associated entryway device **106**. For example, according to certain embodiments, the position sensor **142** may be calibrated such that the processing device **134** of the door closer assembly **104**, or other processing devices of devices of the access control system **100**, may determine what information, such as a measurement(s) or range of measurements, provided by the position sensor **142** corresponds to the door closer assembly **104**, and thus the entryway device **106**, being in a first, closed location and/or a second, open position. Further, such information can be retained for future use in a number of manners such as, for example, as one or more sets of reference information or data by the memory **138** of the processing system **126** of the door closer assembly **104**. Accordingly, instances in which the information subsequently provided by the position sensor **142** falls within and/or is consistent with an existing set of reference information or data, that particular set of reference information or data may provide an indication of the position of the door closer assembly **104** and/or the entryway device **106**, such as, for example, an indication of whether such devices **104**, **106** are in the open or closed location. Conversely, information subsequently provided by the position sensor **142** that falls outside of, or is otherwise inconsistent with, the existing reference information or data may indicate that the door closer assembly **104**, and thus the entryway device **106**, is not in any of the corresponding locations that are associated with the stored reference information.

A variety of reference location information may be utilized for one or more door closer assembly **104** positions. For example, according to certain embodiments, a first set or reference information or data, as provided by information from the position sensor **142**, may correspond to the door closer assembly **104** and/or entryway device **106** being in the closed location. Similarly, in addition to, or in lieu of, the first set of reference information or data, a second set of reference information or data can correspond to the door

closer assembly **104** and/or entryway device **106** being in the fully opened position. Further, a number of other reference locations may be attained, which may allow for a more precise determination of the location of the door closer assembly **104**, and thus the entryway device **106**, when the entryway device is between the open and closed locations. Further, for example, according to certain embodiments, the processing device **134** may utilize an algorithm to evaluate data or information provided by the position sensor **142** and/or the reference location information, to determine the location whether the door closer assembly **104**, and thus the entryway device **106**.

According to the illustrated embodiment, the processing device **134** of the processing system **126** of the door closer assembly **104** may evaluate information provided by the position sensor **142** and determine the position of the door closer assembly **104** and/or the entryway device **106**. According to other embodiments, in addition to, or in lieu of the processing device **134** of the door closer assembly **104**, one or more other components of the access control system **100** may retain the reference information or data from the calibration of the door closer assembly **104** and/or evaluate information provided by the position sensor **142** to determine the position of the door closer assembly **104**, and thus the position of the associated entryway device **106**. For example, according to certain embodiments, the reference information or data obtained by calibration of the door closer assembly **106** may be retained by a memory of the lockset device **102**, server **128**, and/or access control panel or host **130**. Further, such information may be retrieved from the memory of other such devices of the access control system **100** and used by the processing devices of those devices, and/or used by a different one of those other devices, to determine the position of the door closer assembly **104** and/or the entryway device **106**.

The position sensor **142** of the door closer assembly **104** may be calibrated in a number of manners. For example, according to certain embodiments, the position sensor **142** of the door closer assembly **104** may be calibrated through the use of the another device of the access control system **100**, including, but not limited to, the mobile electronic device **132** or credential reader, among other devices. Moreover, such other devices of the access control system **100** may provide an indication of when the entryway device **106** is at a particular reference location, such as, for example at the closed and/or open positions. For example, a user of the mobile electronic device **132** may input information indicating the current position of the door closer assembly **104** and/or entryway device **106**. The processing device **134** of the door closer assembly **104**, via the input/output device **136**, may directly or indirectly receive or retrieve such an indication of the current position of the door closer assembly **104** and/or entryway device **106** and correlate the information provided by the position sensor **142** at or around that time as being reference information or data for the indicated location. For example, according to certain embodiments, if the indicated location is the closed location of the door closer assembly **104** and/or the entryway device **106**, the processing device **134** may designate the information provided by the position sensor **142** at or around that time as a first set of reference information or data that corresponds to the door closer assembly **104**, and thus the entryway device **106**, being in the closed location. Thus, according to certain embodiments, during subsequent operation of the entryway device **106**, when the position sensor **142** provides information that falls within, or complies with, the first set of reference information or data, the processing device of the

door closer assembly **104** may determine that the door closer assembly **104** and/or the entryway device **106** is at the closed location. According to such an embodiment, other sets of reference information or data for other door closer assembly **104** and/or the entryway device **106** positions may be attained, including, for example, a second set of reference information or data that indicates the door closer assembly **104** and/or the entryway device **106** is at the fully open position.

According to other embodiments, the door closer assembly **104** may receive or retrieve information from the lockset device **102** that indicate when the lock mechanism **108** is in the locked condition, which may indicate to the processing device **134** that entryway device **106** and/or the door closer assembly **104** is in the closed location. Thus, according to such an example, the processing device **134** may utilize the information from the lockset device **102** and the corresponding information from the position sensor **142** to establish a set of reference information or data, which in this example may be used to during subsequent operation of entryway device **106** to determine when the door closer assembly **104** and/or entryway device **106** is in the closed location. Further, the processing device **134** may utilize such information and information from other devices, such as, for example, the information from the mobile electronic device **132** to evaluate the accuracy of sets of reference information or data and/or the door closer assembly **104** and/or entryway device **106** positions associated with the set(s) of reference information or data.

While the above example discusses calibrating the position sensor **142** of the door closer assembly **104** through the use, in part, of another device of the access control system **100**, according to other embodiments, calibration of the position sensor **142** of the door closer assembly **104** may utilize components of the door closer assembly **104**. For example, according to certain embodiments, the position of the arm coupling **122** that is displaceable along the slide channel **116** with the displacement of the closer arm **117** may be used to provide an indication to the processing device **134** of the door closer assembly **104** as to whether the door closer assembly **104**, and thus the entryway device **106**, is in the open or closed location. Further, the processing device **134** may evaluate the range of information provided by the position sensor **142** during the opening and closing of the entryway device **106** to generally determining which information corresponds to the door closer assembly **104**, and thus the entryway device **106**, being at certain reference locations, such as, for example, open and closed locations.

According to certain embodiments, the calibration of the door closer assembly **104**, and moreover the ability to generally determine the location or position of the door closer assembly **104** and/or the entryway device **106**, can allow the door closer assembly **104** to assist in the calibration of other components of the access control system **100**. For example, a determination from information of the position sensor **142** of the door closer assembly **104** that the entryway device **106** is in the closed location may be communicated, or otherwise retrieved by, the lockset device **102**. With information that the entryway device **106** is in the closed location, the lockset device **102** may calibrate its own sensor **154**, such as a magnetometer of the lockset device **102**. Moreover, information from the door closer assembly **104** indicating that the door closer assembly **104** and/or the entryway device **106** may be used by the processing device **152** of the lockset device to determine that the information currently being obtained by the sensor **154** of the lockset device **102** is to be associated with a closed location of the

entryway device **106**. According to such an embodiment and/or situation, during subsequent operation of the entryway device **106**, the processing device **152** of the lockset device **102**, through information provided by the sensor **154** of the lockset device **102**, may be able to determine when the entryway device **106** is in, or has returned to, the closed location. Such information as to when the entryway device **106** is in, or has returned to, the closed location may further assist in the operation of the associated lock mechanism **108**.

In addition to the lockset device **102**, the calibrated information for the door closer system **104** may assist in the similar calibration of other devices of the access control system **100**, including, but not limited to, credential readers and mobile electronic devices **132**.

The information provided by evaluation of the information provided by the door closer assembly **104**, and more particularly from evaluation of information obtained from the position sensor **142**, may assist in monitoring the operation of the door closer assembly **104**, and thereby assist in the maintenance and/or security of the access control system **100**. For example, one or more components that are in communication, either directly or indirectly, with the door closer assembly **104**, such as, for example, one or more access control panels or hosts **130** and/or servers **128**, may store and/or monitor information relating to authorization to displace the entryway device **106** from the closed location to an open position, and/or monitor whether the entryway device **106** is, or is not, lockingly secured in a closed location. Thus, according to certain embodiments, the access control system **100** may monitor information provided from the door closer assembly **104**, such as information obtained through use of the position sensor **142**, to determine whether the entryway device **106** has been displaced to, or maintained at, an un-authorized position. For example, according to certain embodiments, in addition to determining the current position of the door closer assembly **104** and/or entryway device **106**, one or more devices of the access control system **100**, including, for example, the door closer assembly **104**, lockset device **102**, server **128**, and/or access control panel or host **130**, may also determine whether the door closer assembly **104**, and thus the entryway device **106**, is, or is not, authorized to be at, or away from, a particular position at that time. For example, according to certain embodiments, the access control system **100** may be managed such that the entryway device **106** is to remain locked at a closed location during certain time periods. During such periods, the magnetometer **144** may be expected to generally provide information that complies with a first set of reference information or data, such as, for example, one or more measurements or range of measurements, that corresponds to the door closer assembly **104** being in the closed location. Thus, during such time periods, discrepancies between the information provided by the position sensor **142** and the first set of reference information or data may provide an indication and/or warning that the door closer assembly **104**, and thus, the entryway device **106**, has been displaced away from the closed location. For example, such information may indicate that the entryway device **106** has potentially been propped and/or pried open. Further, according to certain embodiments, such discrepancies may be detected by the processing device **134** of the door closer assembly **104** and communicated via the input/output device **136** to other devices of the access control system **100**, including, for example, the access control panel or host **130**. Alternatively, such discrepancies may be determined by other devices of the access control system **100**, including, but not limited to, the access control panel or host **130**.

Additionally, the extent the door closer assembly **104**, and thus the entryway device **106**, is displaced from the closed location may provide an indication of the nature by which the entryway device **106** is being held open. For example, according to certain embodiments, if the location of the door closer assembly **104**, and thus the entryway device **106**, is relatively close to, but has not reached, the closed location may provide an indication that the entryway device **106** is being prevented from closing by a force such as, but not limited to, a negative air room pressure. Further, the presence of such interference in the ability of the door closer assembly **104** to return to a closed location may also be indicated by information from the magnetometer that indicates a sudden stoppage in the displacement of the door closer assembly **104**, and thus the entryway device **106**, to the closed location. Further, the larger the distance the door closer assembly **104** is from the closed location may provide an indication of the manner in which the entryway device **106** is potentially being propped or held open, including, for example, the size of the apparatus that may be holding the entryway device **106** open.

According to certain embodiments, the position sensor **142** of the door closer assembly **104** may be utilized in conjunction with a timer **148**, which may or may not be communicatively coupled to the processing device **134** of the door closer assembly **104**. For example, according to certain embodiments, the timer **148** may be part of a processing system **126** that is coupled to the closer body **114**. Further, the timer **148** may be initiated in response to a variety of different events or conditions, including, for example, a change in the information provided by the position sensor **142**. Further, the timer **148** may be used to monitor a variety of aspects of the access control system **100**, including, for example, providing an indication that the entryway device **106** is being propped or held open, or otherwise being prevented from closing, including being prevented from being closed by negative room pressure. Further, according to certain embodiments, the processing device **134** may utilize the timer **148** to monitor whether the duration at which the door closer assembly **104**, and thus the entryway device **106**, is displaced away from the closed location exceeds a predetermined time period. For example, according to certain embodiments, the timer **148** may be initiated upon information from the position sensor **142** indicating that the door closer assembly **104**, and thus the entryway device **106**, has moved away from the closed location. The duration of time that the entryway device **106** is away from the closed location, as indicated by the timer **148**, may provide, for example, an indication of the extent individuals may have had the opportunity to pass through the associated entryway. Moreover, the failure of the entryway device **106** to return to the closed location within the pre-determined time period, as measured by the timer **148**, may indicate whether the entryway device **106** is being held or propped open. Further, according to certain embodiments, the timer **148** may be used to evaluate the sweep time taken for the entryway device **106** to complete its displacement to the closed location and whether such sweep time exceeds a predetermined time period. Further, the processing device **134** may detect any changes in direction of the entryway device **106**, as indicated by information provided by the position sensor **142**, during such sweep time, as the change in direction may indicate unauthorized passage through the associated entryway.

The timer **148** may also provide an indication of the frequency at which the door closer assembly **104**, and thus the entryway device **106**, has experienced a change, if any,

in the direction of displacement. Moreover, a series of changes in direction of displacement of the entryway device **106** in a relatively short time period, may provide an indication of unauthorized tailgating or repeated passage through the associated entryway.

Additionally, according to certain embodiments in which the door closer is adapted to automatically displace the entryway device **106** to a closed location, such as, for example, embodiments in which the door closer assembly **104** has an electric motor, the processing device **134** of the door closer assembly **104** may evaluate information from the position sensor **142** and/or the timer **148** and determine whether to attempt to automatically displace the entryway device **106** to the closed location. For example, according to certain embodiments, the processing device **134** may consider, based on information from the position sensor **142** and corresponding reference information or data, the proximity of the entryway device **106** to the closed location. Further, the processing device **134** may at least attempt to determine, based on information from the position sensor **142** indicating the direction of displacement of the entryway device **106** and/or the present location of the door closer assembly **104** whether the entryway device **106** was being returned to the closed location. The processing device **134** may also consider, based on information from the timer **148**, the duration of time since the entryway device **106** has returned to the closed location, the duration of time since the last change in direction of displacement of the door closer assembly **104** and/or entryway device **106**, and/or the frequency in changes in the direction of such displacements when evaluating whether to attempt to automatically return the entryway device **106** to the closed location.

The access control system **100** may further include one or more monitoring devices **150**, such as, for example, a motion sensor **152a**, video camera **152b**, and/or microphone **152c**, that may be activated in response to information provided by the position sensor **142** and/or the timer **148**. Further, according to certain embodiments, the monitoring device **150** may be activated by an instruction that may be initiated by the processing device **134** of the door closer assembly **104**. For example, according to certain embodiments, the processing device **134** of the door closer assembly **104**, via the input/output device **136**, may communicate an instruction directly or indirectly for the activation of the monitoring device **150**. Further, according to certain embodiments, the door closer assembly **104** may transmit the signal to the access control panel or host **130** indicating a detected discrepancy in the operation of the door closer assembly **104** and/or entryway device **106** that may result in the access control panel or host **130** issuing an instruction to activate one or more monitoring devices **150** to monitor the area around or in the proximity of the associated entryway.

The monitoring device **150** may be initiated by a variety of types of information that is detected or otherwise indicated by the operation of the position sensor **142** and/or the timer **148**. For example, according to certain embodiments, the monitoring device **150** may be activated when the processing device **134** detects that the position sensor **142** has indicated a plurality of changes in direction in a relatively short time period, as measured through the use of the timer **148**, which may indicate, for example, at least the presence of tailgating through the associated entryway and/or the entryway device **106** being held or propped open. The processing device **134** may also activate the monitoring device **150** after the position sensor **142** indicates that the door closer assembly **104**, and thus the entryway device **106**, has not returned to the closed location within a predeter-

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mined time period, as indicated using information from the timer 148. Further, according to certain embodiments, the processing device 134 can activate the monitoring device 150 when information from the position sensor 142 indicates that the door closer assembly 104, and thus the entryway device 106, was in the process of being displaced toward the closed location before the entryway device 106 experienced a change in displacement direction, such as, for example, being displaced back toward an open position.

While the invention has been described in connection with what is presently considered to be the most practical and preferred embodiment, it is to be understood that the invention is not to be limited to the disclosed embodiment (s), but on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims, which scope is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures as permitted under the law. Furthermore it should be understood that while the use of the word preferable, preferably, or preferred in the description above indicates that feature so described may be more desirable, it nonetheless may not be necessary and any embodiment lacking the same may be contemplated as within the scope of the invention, that scope being defined by the claims that follow. In reading the claims it is intended that when words such as “a,” “an,” “at least one” and “at least a portion” are used, there is no intention to limit the claim to only one item unless specifically stated to the contrary in the claim. Further, when the language “at least a portion” and/or “a portion” is used the item may include a portion and/or the entire item unless specifically stated to the contrary.

The invention claimed is:

1. A method comprising:
 - detecting, by a position sensor, data indicating a position of a door closer assembly, wherein at least a portion of the position sensor is positioned within the door closer assembly and at least a portion of the door closer assembly is coupled to an entryway device;
 - transmitting the detected data to a processing device;
 - evaluating, by the processing device, the detected data in view of one or more sets of reference data, the one or more sets of reference data corresponding to one or more locations of the door closer assembly; and
 - determining, based on the evaluation of the detected data and the one or more sets of reference data, a current location of the door closer assembly;
 - wherein the one or more sets of reference data includes a first set of reference data that corresponds to the door closer assembly being at a closed location.
2. The method of claim 1, wherein the step of evaluating the detected data includes determining whether the detected data is, or is not, consistent with data of the first set of reference data.
3. The method of claim 2, wherein the detected data is one or more measurements, and wherein the data of the one or more sets of reference data comprises one or more sets of measurements or ranges of measurements.
4. The method of claim 3, further including the step of activating a timer upon detection of displacement of the door closer assembly from the closed location to an open position.
5. The method of claim 4, further including the step of determining, by the processing device and through use of the timer, whether the door closer assembly has been at the open location for a period of time that exceeds a predetermined time period.

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6. The method of claim 5, further including the step of activating a monitoring device to monitor an area around an entryway if the period of time that the door closer assembly has been at the open location is determined to exceed the predetermined time period.

7. The method of claim 6, wherein the monitoring device includes at least one of the following: a camera and a motion sensor.

8. The method of claim 4, further including the steps of: detecting, by the position sensor, a plurality of changes in one or more directions of displacement of the door closer assembly; and evaluating, by the processing device and using the timer, a frequency of the detected plurality of changes in the one or more directions of displacement of the door closer assembly.

9. The method of claim 8, further including the step of activating one or more monitoring devices if the frequency of the detected plurality of changes in the one or more directions exceeds a predetermined frequency of changes in displacement direction.

10. The method of claim 8, wherein the one or more directions of displacement comprises an opening direction and a closing direction; and

wherein detecting the plurality of changes in the one or more directions of the displacement of the door closer assembly comprises detecting a plurality of changes between the opening direction and the closing direction.

11. The method of claim 8, wherein detecting the plurality of changes comprises determining a number of changes in the one or more directions of displacement of the door closer assembly between the activation of the timer and a return of the door closer assembly to the closed location.

12. The method of claim 4, wherein the processing device is a processing device of the door closer assembly.

13. The method of claim 1, wherein the door closer assembly comprises a door closer body and at least one door closer arm.

14. A method comprising:

detecting, by a position sensor, data indicating a position of a door closer assembly, at least a portion of the position sensor positioned within the door closer assembly;

transmitting the detected data to a processing device; evaluating, by the processing device, the detected data in view of one or more sets of reference data, the one or more sets of reference data corresponding to one or more locations of the door closer assembly; and determining, based on the evaluation of the detected data and the one or more sets of reference data, a current location of the door closer assembly;

wherein the door closer assembly is located on an entryway device, and wherein the processing device is located within a lockset device at least partially located on the entryway device; and

further comprising calibrating a magnetometer located within the lockset device using the detected data.

15. The method of claim 14, wherein the position sensor is an inductive sensor.

16. The method of claim 14, wherein the data transmitted from the position sensor to the processing device is transmitted wirelessly via Bluetooth.

17. The method of claim 14, wherein the data transmitted from the position sensor to the processing device is transmitted wirelessly via WIFI.

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18. The method of claim 14, wherein the data transmitted from the position sensor to the processing device is transmitted via a wired connection.

19. A method comprising:

detecting, by a position sensor, data indicating a position
of a door closer assembly, at least a portion of the
position sensor positioned within the door closer
assembly;

transmitting the detected data to a processing device;

evaluating, by the processing device, the detected data in
view of one or more sets of reference data, the one or
more sets of reference data corresponding to one or
more locations of the door closer assembly; and

determining, based on the evaluation of the detected data
and the one or more sets of reference data, a current
location of the door closer assembly;

wherein at least a portion of the door closer assembly is
coupled to an entryway device; and further comprising:

determining, by the processing device using the data
indicating the position of the door closer assembly, that
at least one of the door closer assembly and the
entryway device is at a closed location;

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communicating to a lockset device coupled to the entry-
way device the determination of the processing device
that at least one of the door closer assembly and the
entryway device is at the closed location; and

calibrating, upon receipt of the communication that at
least one of the door closer assembly and the entryway
device is at the closed location, a second sensor located
within the lockset device.

20. The method of claim 19, wherein the second sensor
located within the lockset device is a magnetometer.

21. The method of claim 19, wherein the step of deter-
mining that at least one of the door closer assembly and the
entryway device is at the closed location includes evaluating
the data indicating the position of the door closer assembly
in view of one or more sets of reference information, at least
one of the one or more sets of reference information corre-
sponding to a sensor measurement or range of measurements
when at least the door closer assembly is at the closed
location.

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